IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTEREFERENCES

Appl. No.	:	10/578,057	Conf. No.: 4920
Appellant	:	Csaba Szeles et al.	
Filed	:	March 19, 2007	
Art Unit	:	2884	
Examiner	:	Carolyn Igyarto	
Docket No.	:	EI-EV-061141	
Title	:	RADIATION DETECTOR	
Customer No.	:	41245	

Honorable Commissioner of Patents and Trademarks
Alexandria, VA 22313

APPEAL BRIEF

S I R:

This Appeal Brief is responsive to the Final Office Action dated January 22, 2009 and the Advisory Action dated July 29, 2009 in the above-identified application.

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Status of Amendments

The subject patent application was filed on November 10, 2003. A first Office Action rejecting claims 1 through 7 was issued on June 12, 2008. A Response After Non-Final Action in response thereto was filed on October 10, 2008. A telephone interview took place on October 15, 2008. An Office Action finally rejecting claims 1 through 7 was mailed on January 22, 2009. An Amendment in Response after Final Rejection thereto, adding claim 8, was filed on July 17, 2009. An Advisory Action, affirming the rejection of claims 1 through 7, was mailed July 29, 2009 and indicated that the proposed amendment raised new issues.

Summary of Claimed Subject Matter

The invention is a radiation detector and method of making same. The detector is made from a compound or alloy comprising: $Cd_xZn_{1-x}Te$, where $0 \leq x \leq 1$, an element from column III or column VII of the periodic table in a concentration about 10 to 10,000 atomic parts per billion, and a rare earth element. The rare earth element is selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu in a concentration about 10 to 10,000 atomic parts per billion. The invention is also a method of forming a radiation detector compound or alloy, the steps comprising (a) providing a mixture of Cd, Zn and Te; (b) heating the mixture to a liquid state; (c) adding to the liquid mixture a first dopant that adds shallow level donors (electrons) to the top of an energy band gap of said mixture when it is solidified; (d) adding to the liquid mixture a second dopant that adds deep level donors and/or acceptors to the middle of said band gap of said mixture when it is solidified; and (e) solidifying said mixture including said first and second dopants to form the compound.

Claim 1 recites a radiation detector made from a compound that includes $Cd_xZn_{1-x}Te$, where $0 \leq x \leq 1$, an element from column III or column VII of the periodic table in a concentration about 10 to 10,000 atomic parts per billion, and a rare earth element. The rare earth element is selected from the group consisting of La, Ce, Pr,

Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu in a concentration about 10 to 10,000 atomic parts per billion.

Claim 2 recites a method of forming a radiation detector compound comprising a mixture of Cd, Zn, and Te that is heated to a liquid state. A first dopant that adds shallow level donor electrons to the top of an energy band gap of the liquid mixture once it is solidified. A second dopant is added to the liquid mixture which adds deep level donors and/or acceptors of the middle of the band gap of the mixture when it is solidified. The mixture is then solidified.

Claim 3, dependent on claim 2, recites the fact that the first dopant is from column III or column VII of the periodic table.

Additional claims ultimately dependent on claim 2 recite the following features:

- the first dopant is an element from column III or column VII of the periodic table.
- a concentration of the first dopant in the compound is about 10 to 10,000 atomic parts per billion.
- the second dopant is an element selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.
- a concentration of the second dopant in the compound is about 10 to 10,000 atomic parts per billion.

Claim 4, dependent on claim 3, recites the first dopant is an element selected from a group consisting of B, Al, Ga, In, Tl, F, Cl, Br and I.

Grounds of Rejection to be Reviewed on Appeal

Claims 1-7 were originally rejected under 35 U.S.C. §103(a) as being unpatentable over KAZANDJIAN et al. (USP 4,642,799) in view of KULWICKI (USP 5,314,651) and UEKITA et al. (USP 4,907,043).

Grouping of the Claims

Group 1 consists of claims 1 through 7 and concerns the aforementioned rejection under 35 U.S.C. §103(a).

ARGUMENTS

Group I:

Claims 1-7 were rejected under 35 U.S.C. §103(a), as being unpatentable over KAZANDJIAN et al. (USP 4,642,799) in view of KULWICKI (USP 5,314,651) and UEKITA et al. (USP 4,907,043).

Examiner notes the amendment of claim 2 narrows the scope of the claim, changing the alternative limitation of donors and/or acceptors to the exclusive limitation of donors, which would require further consideration and/or search. Appellant agrees that the amendment of claim 2 narrowed the scope. As stated in the specification of the application (page 5, paragraph 0018), the second dopant electrically compensates the residual net charge carriers given by the difference of the concentration of acceptors and donors. Thus, Appellant welcomes the opportunity to amend claim 2 back to its original form.

Examiner notes that combining a polycrystalline material with an element from column II of the periodic table and a rare earth element are disclosed in KULWICKI. Additionally, Examiner notes that it is known in the art that CdTe and ZnTe are examples of polycrystalline material (UEKITA et al.). Therefore, Examiner believes that one of ordinary skill would recognize that it would be obvious to try having the additional

elements, taught by KAZANDIJAN, be rare earth elements such as La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, and Er.

Appellant agrees with Examiner that combining a polycrystalline material with an element from column II of the periodic table and a rare earth element are disclosed in KULWICKI. However, KULWICKI discloses doping polycrystalline with an element from column II. This is not the same as doping CdZnTe with elements from column VII as disclosed in the present invention. Elements from column VII have seven electrons in the outer shell and either gain one electron to become a -1 ion or they make one covalent bond. These elements are diatomic gases due to the strong tendency to bond to each other with a covalent bond; they have the highest electronegativity. Elements in column II, on the other hand, have very low electronegativity. They have two electrons in the outer shell and all have a valence of +2. They lose not only one electron, but two or none.

Further, KULWICKI discloses combining donor elements Nb, TA, Bi, Sb, Y, La, Ce, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er with acceptors such as Co, Cu, Fe, Mn, Ru, Al, Ga, Mg, Sc, K, Na, U, In, Mg, Ni, or Yb (column 2, lines 2-9). While Appellant agrees that the acceptor elements are rare earth metals, once again, the donor elements recited in KULWICKI are all from column II of the periodic table and use barium strontium titanate, not CdZnTe, as recited in Appellant's claims.

Additionally, as stated above, and unlike either KAZANDJIAN et al. or KULWICKI, Appellant's invention deals with combining elements from columns III or VII of the periodic table with rare earth elements. Neither reference discloses or suggests using group VII elements. In addition, it would not be apparent to one of ordinary skill in the art to use group VII elements because they have more electronegativity than those from group II or III. Thus, one of ordinary skill in the art would not necessarily know if group VII elements would react in the same manner with the rare earth elements. Also, group III and VII elements have impurities that can serve as donors that compensate for the effect of acceptors such as cadium vacancies when using CdZnTe. This is not necessarily the case when combining a donor element including barium strontium titanate as recited in KULWICKI. Thus, initially using these two references, one of ordinary skill in the art would not know to combine CdTnZe with column VII elements and still be able to create the desired radiation detector.

Appellant also respectfully disagrees that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the additional element taught by KAZANDJIAN et al. be a rare earth element as disclosed in KULWICKI and UEKITA et al. KAZANDJIAN et al. involves only elements from column III of the periodic table (column 6, lines 49-50) and no rare earth elements. Appellant's invention, however, uses elements from column III or column VII of the periodic table with a rare earth element.

UEKITA et al. disclose doping the polycrystalline thin films with Mn, Cu, Ag, and rare earth fluorides such as TbF_3, SMF_3, ERF_3, HoF_3, PrF_3, and TMF_3 in addition to rare earth elements. Thus, while Examiner argues that one of ordinary skill in the art may be able to realize the combination of CdTnZe with a rare earth element to form a detector, Appellant respectfully disagrees. The additional elements in UEKITA, Mn, Cu, and Ag, are electron acceptors and not donors. Appellant's claim 1 does not require the addition of those electron acceptors or the rare earth fluorides to CdTnZe.

As Examiner observes, obviousness can be established only by combining or modifying the teaching of the prior art to produce the claimed invention where there is some teaching, suggestion or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In Re Fine*, 837 F.2d 1071 (1986).

Thus, Appellant respectfully disagrees with Examiner, in that one of ordinary skill in the art would NOT know to make Appellant's detector using the prior art. Chemistry reactions are very specific to the attributes of each element of the equation. Thus, one of ordinary skill, through the use of the three cited references, would not find it suggestive to use a compound of CdZnTe, combined with rare earth elements mentioned in UEKITA et al. and KULWICKI, with elements from column III disclosed in KAZANDJIAN et al. to create the reaction.

In addition, Appellant's invention can use elements from column III or VII, but none of the prior art mentions using elements from column VII. In other words, combining dopants in the presence of new materials, while lacking other materials from prior art, and achieving the same effect is not suggested, motivated, or taught by the references as obvious to try by one of ordinary skill in the art.

The KAZANDJIAN et al., KULWICKI, and UEKITA et al. documents, either individually or in combination, do not teach or suggest a reason to combine the known elements in the fashion recited in the claims. Therefore, there is no teaching, suggestion or motivation found either in the three references themselves or in the knowledge generally available to one of ordinary skill in the art. Accordingly, these documents do not render obvious claims 1-7.

For the foregoing reasons, this Honorable Board is respectfully requested to reverse the Examiner's rejections.

Respectfully submitted,
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Claims Appendix

1. A radiation detector made from a compound comprising: $Cd_xZn_{1-x}Te$, where $0 \leq x \leq 1$; an element from column III or column VII of the periodic table in a concentration about 10 to 10,000 atomic parts per billion; and a rare earth element selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu in a concentration about 10 to 10,000 atomic parts per billion.

2. A method of forming a radiation detector compound comprising:

(a) providing a mixture of Cd, Zn and Te;

(b) heating the mixture to a liquid state;

(c) adding to the liquid mixture a first dopant that adds shallow level electron donors to the top of an energy band gap of said mixture when it is solidified;

(d) adding to the liquid mixture a second dopant that adds deep level donors to the middle of said band gap of said mixture when it is solidified; and

(e) solidifying said mixture including said first and second dopants to form the compound.

3. The method of claim 2, wherein the first dopant is an element from column III or column VII of the periodic table.

4. The method of claim 3, wherein the first dopant is an element selected from the group consisting of B, Al, Ga, In, Tl, F, Cl, Br and I.

5. The method of claim 2, wherein a concentration of the first dopant in the compound is about 10 to 10,000 atomic parts per billion.

6. The method of claim 2, wherein the second dopant is an element selected from the group consisting of La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb and Lu.

7. The method of claim 2, wherein a concentration of the second dopant in the compound is about 10 to 10,000 atomic parts per billion.